THE EFFECTS OF VIBRATIONAL CUES ON PHYSIOLOGICAL DEVELOPMENT IN *Polistes fuscatus*

Kate Hunter

Symposium on Undergraduate Research

Introduction to the paper wasp (*Polistes fuscatus*)

- Ecological role
  - Pollinators
  - Eat garden pests!
- Social behavior

Social Behavior

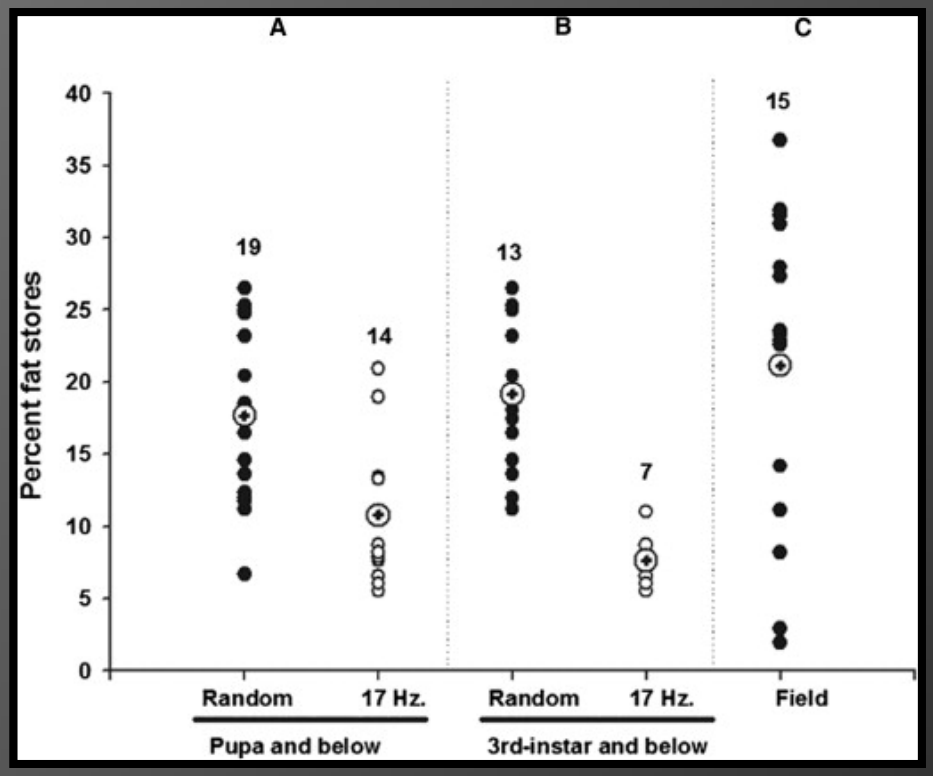
- Life History
- Different roles/physiology in the nest:

Queens	Workers
Parent to all offspring	Daughters to the queen
More fat stores (lipids) but still relatively the same size	Less fat stores (lipids)
New generations hibernate over the winter	Generations die once the season is over
Forage at first, then focus on egg-laying	Forage and help raise the young

- Interesting vibration behavior

Simulated antennal drumming influences larva physiology

- Lipid content decrease correlates with vibration



Suryanarayanan (2011) Current Biology. 21 (3): 231-235.

Questions

- Does the distance the vibration travels on a nest affect the lipid content of the wasp?
  - Vibrating one cell or vibrating an entire nest
    - Purpose of the research
    - Expectations
    - Methods
    - Results

Purpose for this research

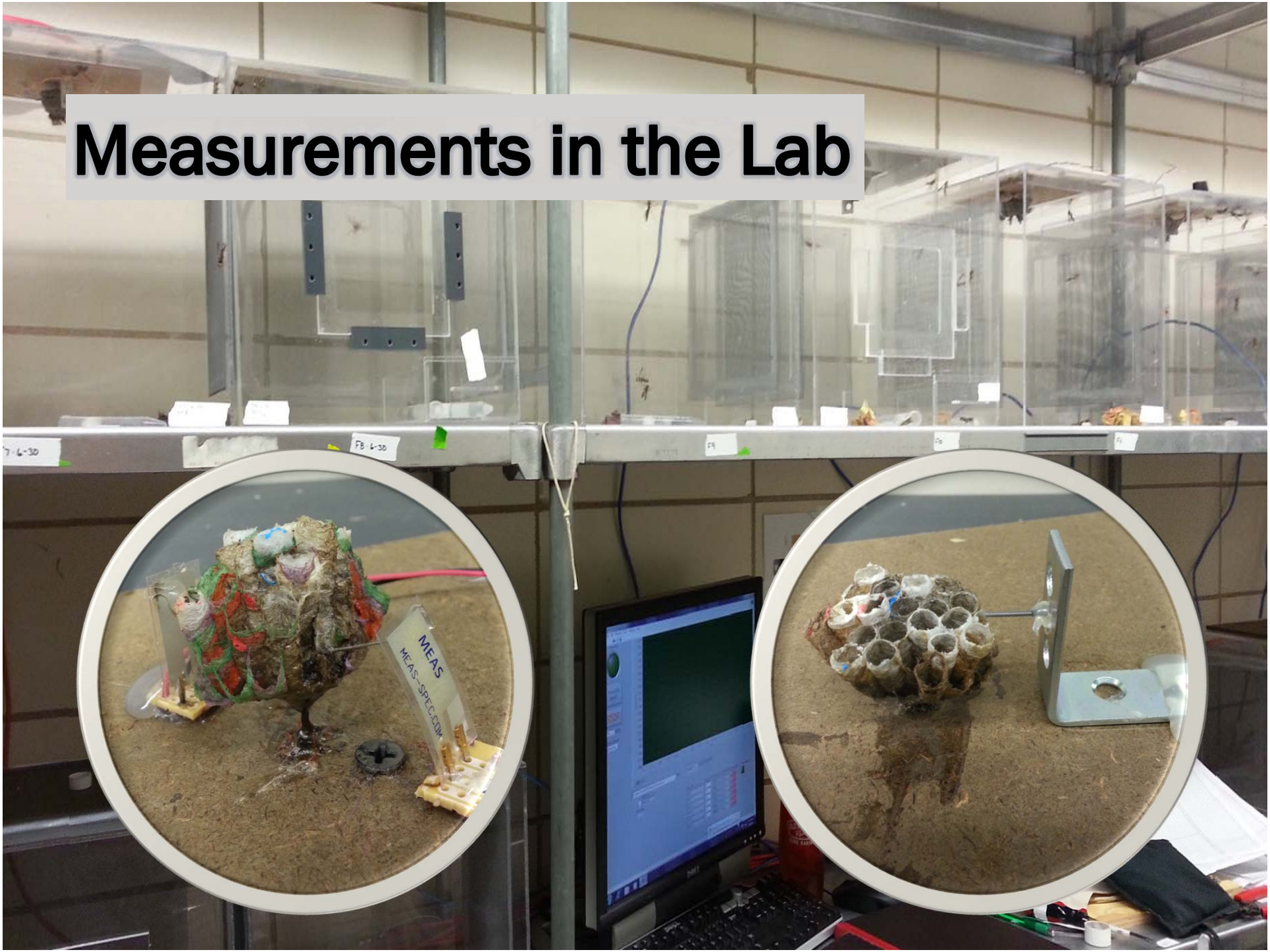
- Answers if a queen is required to vibrate each cell or an entire nest
- Tells us what the potential importance of nest size is
- Sheds some light on an interesting behavior by an important organism

Hypotheses

- H_0: If the effects of vibration are felt all over the nest equally then we shouldn't see a change in lipid content as distance increases.

- H_1: If the effects of vibration change as it travels through the nest then we expect to see an increase in lipid content in larva further from the vibration.

Measurements in the Lab



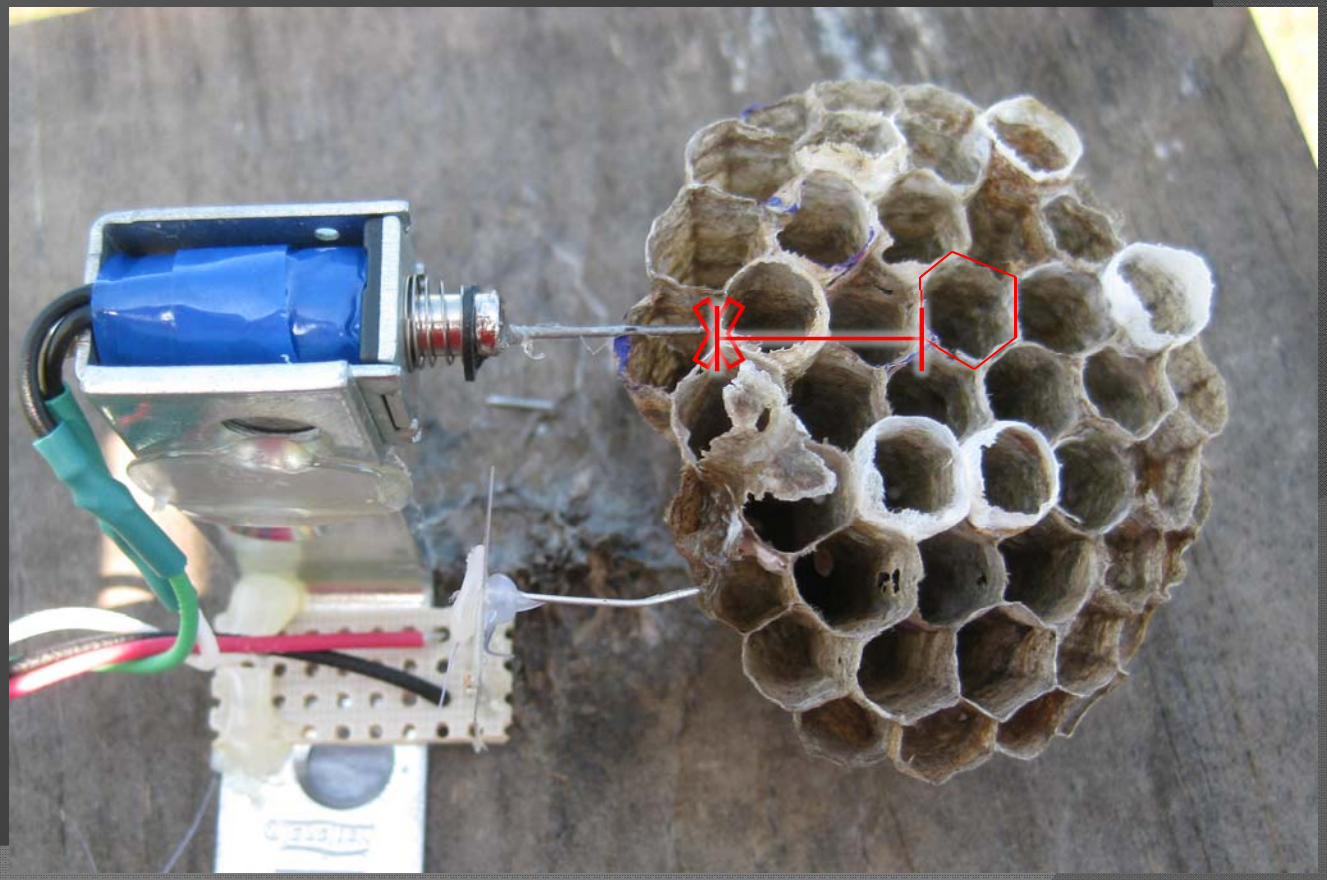
Measurements in the field

Lipid Quantification Data

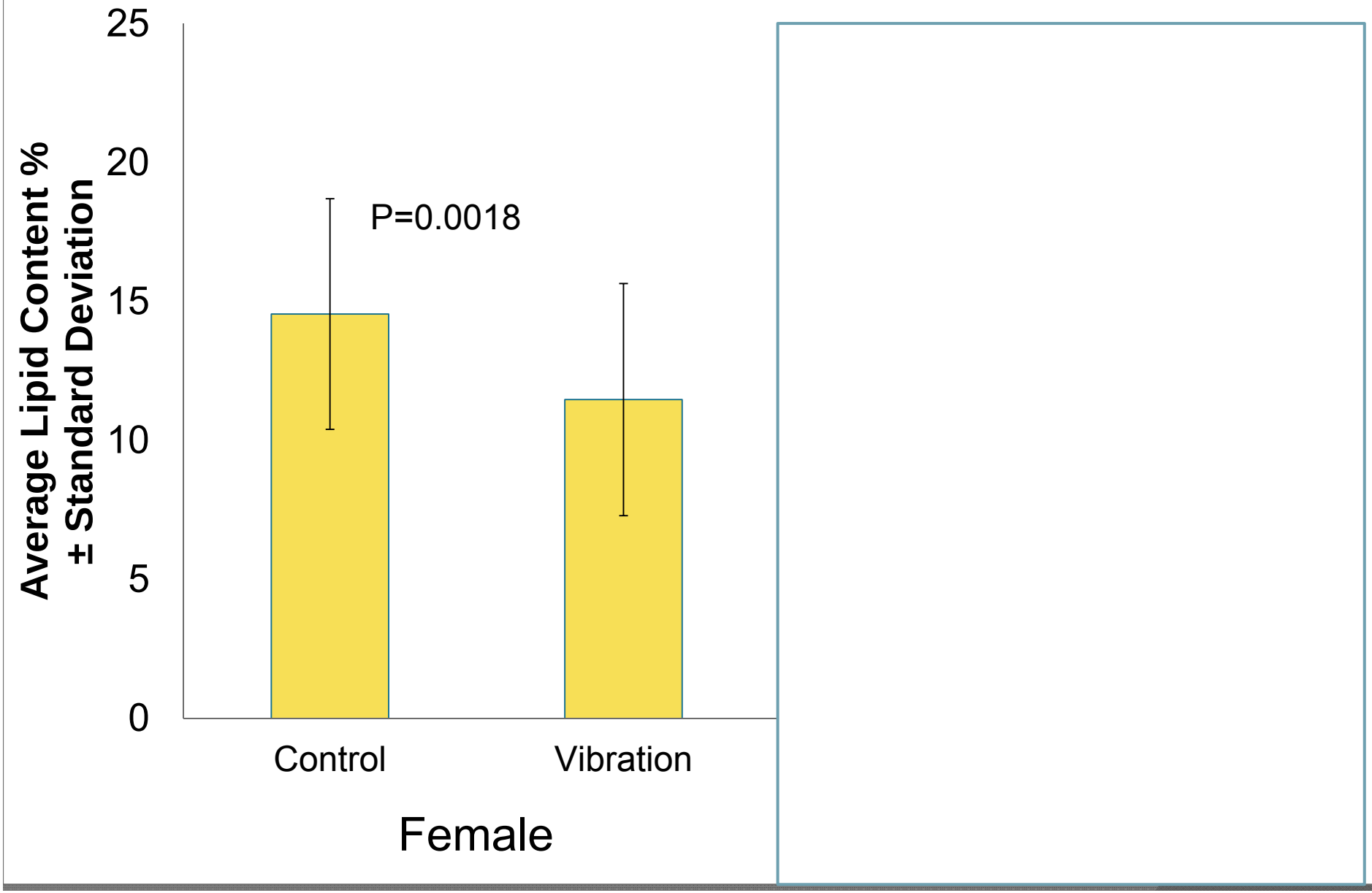
- Extracted and quantified lipids from the body of the larva

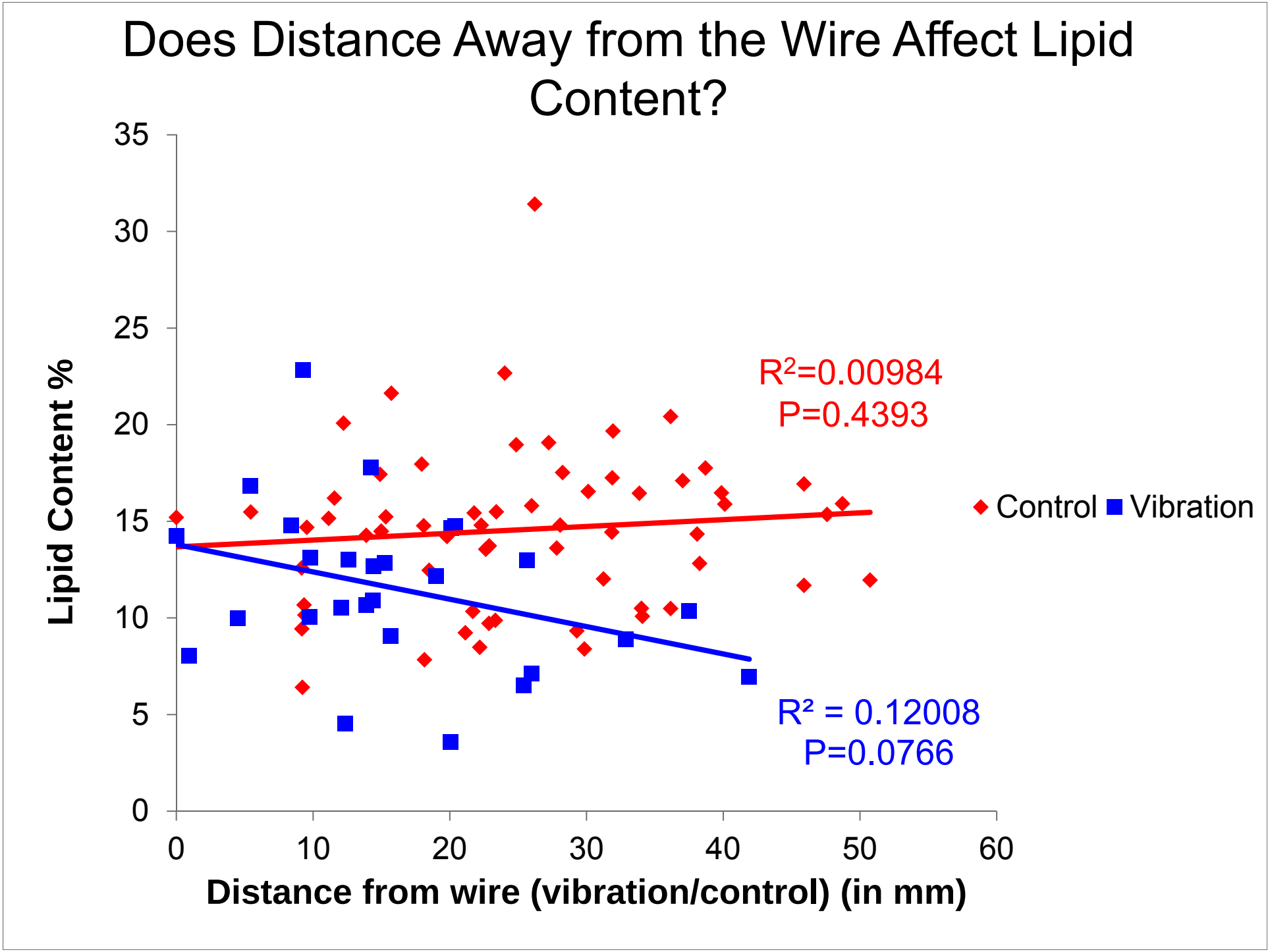
Distance measurement

- Measured the distance from wire to nearest part of a cell



Does vibration on a nest affect lipid content?




Does Distance Away from the Wire Affect Lipid Content?
Lipid Content %
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
Distance from wire (vibration/control) (in mm)
R²=0.00984
P=0.4393
R² = 0.12008
P=0.0766
Control
Vibration

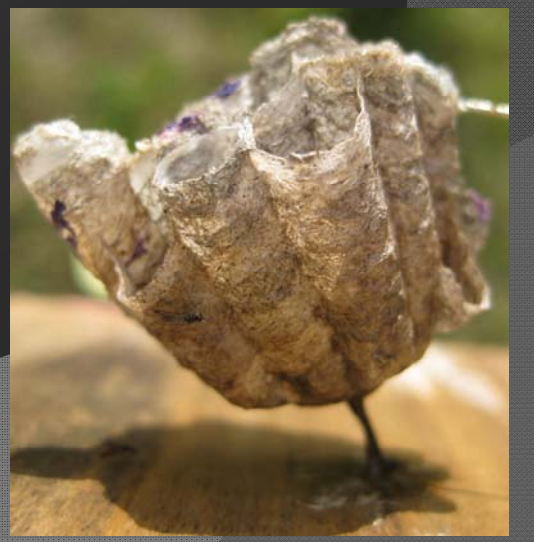
Conclusion

- Q1: Does vibration affect lipid content?
  - Yes, in females
  - Significance for role decisions in wasps
- Q2: Does distance away from a vibration affect the lipid content of a female wasp?
  - No
  - Queen produces generations of similar physiologies

Future Research Questions

- What does the material/shape of the nest do to the vibration?
  - Effects of the cocoon
  - Effects of paper
- What does this mean for communication by vibration in other organisms?
  - Substrate-borne vibroacoustics

Vs.



Questions? Comments?

Acknowledgements

- Amy Geffre
- Megan Harrison
- Jennifer Jandt
- Amy Toth
- Works Cited:

Suryanarayanan, S., Hermanson, J.C. & Jeanne, R.L. (2011). A Mechanical Signal Biases Caste Development in a Social Wasp. *Current Biology*, *21*(3), 231-235. http://www.sciencedirect.com/science/article/pii/S0960982211000042

- Pictures:

http://phenomena.nationalgeographic.com/2011/12/01/sociable-wasps-have-an-eye-for-faces/
Bob Jeanne
Jennifer Jandt